DRAFT
Engineering & Operations Workgroup
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Potential Model Scenarios
Oroville Facilities Relicensing

The Department and consultant modeling team has developed an initial list of scenarios to analyze using the operations models. These scenarios are intended to cover a broad range of resource actions being considered. Some proposed resource actions may only require minor changes to the base operational scenario. Such changes may be analyzed by performing sensitivity analyses on the benchmark model runs. Some proposed resource actions may require analyses that assume major changes in facility operations. These analyses would be done with bookend model runs; in other words, model runs that represent end points beyond which no further analyses of proposed actions is warranted. The following is a preliminary list of operational modeling scenarios.

- **BENCHMARK SCENARIO:** This scenario uses the current or future[1] level-of-development hydrology as well as the current regulatory framework (which includes the existing biological opinions for steelhead and spring-run chinook salmon). This scenario is the basis for comparing all other operational scenarios.

  Models Used:
  - CALSIM II provides the monthly boundary conditions for the local operations model (HYDROPS). The CALSIM II benchmark scenario for the current level-of-development was completed September 30, 2002. It was recently updated and is currently being reviewed by DWR operations staff for consistency. The updated benchmark study will be available to develop boundary conditions for HYDROPS by the end of April.
  - HYDROPS provides detailed operational data for the Oroville Facilities. The local operations benchmark model run will be completed by the end of May.
  - WQRRS simulates the temperature conditions in the main reservoir, the Thermalito Complex and the Feather River. The temperature benchmark model run will be completed by the end of June.

  Period for Analysis: Entire synthetic hydrologic data set.

- **TEMPERATURE CONFLICTS:** In addition to conflicts between temperature objectives for fishery needs in the river and facility operational flexibility, there may also be interest for providing warm water for agricultural diversions from Thermalito Afterbay while providing cold water to fish in the hatchery and Feather River. Several temperature-related scenarios have been identified and are listed.

[1] The Department is working on a synthetic hydrologic dataset for CALSIM II that is based upon a 2030 level-of-development. This new hydrologic time series is expected to be completed by the end of June, 2003.

- **Temperature Sensitivity Scenario 1**: This scenario is the same as the Benchmark scenario except pump-back operations are eliminated to estimate the effects of pump-back on water temperatures in Thermalito Afterbay and the Feather River.
  Models Used:
  - ✓ HYDROPS: Input data and assumptions are the same as those developed for the local operations benchmark model run, except pump-back operations are constrained to zero.
  - ✓ WQRRS:

  Period for analysis will be a selected set of years. This could either be (1) a contiguous series of 20 or more years or (2) individual years from the synthetic hydrologic data set.
  Special Analysis: Compare the following parameters to the Benchmark Scenario:
  - ✓ Foregone generation
  - ✓ Changes in temperatures to diversions from the Thermalito Afterbay.
  - ✓ Changes in temperatures in the Feather River.

- **Temperature Sensitivity Scenario 1a:** In addition to eliminating pump-back operation, this scenario also "flattens" the generation pattern – no peaking of the generation – from May through September to test effects that peaking would have on water temperatures in Thermalito Afterbay and the Feather River.
  Models used:
  - ✓ HYDROPS: Input data and assumptions are the same as those used in the local operations benchmark model run, except pump-back operations are constrained to zero and peaking of the generation is eliminated.
  - ✓ WQRRS:

  Period for analysis will be a selected set of years. This could either be (1) a contiguous series of 20 or more years or (2) individual years from the synthetic hydrologic data set.
  Special Analysis: Compare the following parameters to the Benchmark Scenario:
  - ✓ Foregone generation
  - ✓ Changes in temperatures to diversions from Thermalito Afterbay.
  - ✓ Changes in temperatures in the Feather River.

- **Temperature Sensitivity Scenario 2:** This scenario is the same as the Benchmark Scenario; except the release to the low-flow section of the

Feather River will be increased during the key spawning and rearing period (June through December)[2].

Models Used:

- ✓ HYDROPS: Input data and assumptions are the same as those used in the local operations benchmark model run, except more water will be released to the low flow section from June through December.
- ✓ WQRRS:

Period for analysis will be a selected set of years. This could either be (1) a contiguous series of 20 or more years or (2) individual years from the synthetic hydrologic data set.

Special Analysis: Compare the following parameters to the Benchmark Scenario:

- ✓ Foregone generation.
- ✓ Changes in temperatures to diversions from Thermalito Afterbay.
- ✓ Changes in temperatures in the Feather River.

- FEATHER RIVER FLOW CONDITIONS: This set of scenarios is to assess specific measures to improve habitat conditions with flow. Generally, changes in flow will increase the area that may be spawned, scour, or erosion. In many cases, such measures will have benefits to habitat by lowering water temperatures for rearing or spawning fish.

  - **Flow Sensitivity Scenario 1:** This scenario is the same as the Benchmark Scenario except the release to the low flow section of the Feather River will be "ramped up" during the key spawning period in the fall. Once the flow is ramped to the desired level, it will be maintained until the larval fish emerge from the gravel.

    Models Used:

    - ✓ HYDROPS: Input data and assumptions are the same as those used in the local operations benchmark model run, except more water will be released to the low flow section during the fall and winter **(***** Dave Olson, need specifics ******)**.
    - ✓ WQRRS:

- **WATER SUPPLY IMPACT ON LAKE OROVILLE WATER LEVELS:** This set of scenarios is to evaluate how sensitive Oroville lake levels are to varying levels of SWP demands.

  Models Used:

  - CALSIM II: The approach is to fix the maximum demand for water from the State Water Project at various levels.

  Period for Analysis: Entire synthetic hydrologic data set.

[2] The magnitude of the release will be determined based upon results from various fisheries studies.

Special Analysis: Compute monthly reservoir water levels from the model results. The results are then compared to results from the Benchmark Scenario. A set of exceedence curves will be plotted to show changes in water levels for each month of the year.

- **OPERATIONAL CHANGES TO ENHANCE DOWNSTREAM FLOOD PROTECTION:** This set of scenarios is to assess how changes in flood reservation impact flood release magnitudes and water supply.

  - **Route Flood Flows through the Reservoir:** The approach would be to perform reservoir routing analysis when addition storage space is used as flood reservation. Specifically, 50, 100, and 150 TAF of additional flood reservation space would be evaluated.
    Models Used: The specific tool is to be determined, but most likely the tool of choice would be HEC 5.
    Period for Analysis: Use specific reservoir inflow hydrographs used in the USACE Comprehensive study.
    Special Analysis: Compare the output hydrographs to those produced in the Comprehensive Study.

  - **Determine Impacts on other Resource Areas:**
    Models Used:
    - ✓ CALSIM II: Adjust the maximum storage condition per the criteria developed above for flood reservation. CALSIM II would provide an assessment of potential impacts to water supply.
    - ✓ HYDROPS could assess power impacts associated with lower reservoir storage.

    Period for analysis: Entire synthetic hydrologic data set for water supply analysis. A smaller dataset could be used for foregone generation analysis.